National Institute of Environmental Health Sciences

# Stratospheric ozone, global warming, and the principle of unintended consequences--An ongoing science and policy success story

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**Abstract:**

In 1974, Mario Molina and F. Sherwood Rowland warned that chlorofluorocarbons (CFCs) could destroy the stratospheric ozone layer that protects Earth from harmful ultraviolet radiation. In the decade after scientists documented the buildup and long lifetime of CFCs in the atmosphere; found the proof that CFCs chemically decomposed in the stratosphere and catalyzed the depletion of ozone; quantified the adverse effects; and motivated the public and policymakers to take action. In 1987, 24 nations plus the European Community signed the Montreal Protocol. Today, 25 years after the Montreal Protocol was agreed, every United Nations state is a party (universal ratification of 196 governments); all parties are in compliance with the stringent controls; 98% of almost 100 ozone-depleting chemicals have been phased out worldwide; and the stratospheric ozone layer is on its way to recovery by 2065. A growing coalition of nations supports using the Montreal Protocol to phase down hydrofluorocarbons, which are ozone safe but potent greenhouse gases. Without rigorous science and international consensus, emissions of CFCs and related ozone-depleting substances (ODSs) could have destroyed up to two-thirds of the ozone layer by 2065, increasing the risk of causing millions of cancer cases and the potential loss of half of global agricultural production. Furthermore, because most, ODSs are also greenhouse gases, CFCs and related ODSs could have had the effect of the equivalent of 24-76 gigatons per year of carbon dioxide. This critical review describes the history of the science of stratospheric ozone depletion, summarizes the evolution of control measures and compliance under the Montreal Protocol and national legislation, presents a review of six separate transformations over the last 100 years in refrigeration and air conditioning (A/C) technology, and illustrates government-industry cooperation in continually improving the environmental performance of motor vehicle A/C.

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## Resource Description

**Exposure :**

weather or climate related pathway by which climate change affects health

Solar Radiation

**Geographic Feature:**

resource focuses on specific type of geography

None or Unspecified

**Geographic Location:** ☑

resource focuses on specific location

Global or Unspecified

**Health Impact:** ☑

specification of health effect or disease related to climate change exposure

Cancer, Dermatological Effect

**Resource Type:** ☑

format or standard characteristic of resource

Policy/Opinion

**Timescale:** ☑

time period studied

Time Scale Unspecified